ON THE DESIRABILITY AND COST-FEASIBILITY OF REJOINING THE FINANCIAL RESEARCH INSTITUTE (FRI)

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Introduction:

At its September meeting, the Finance Department appointed a task force, consisting of Profs. Kryzanowski, Pradhan and Tomaski, to report on the desirability and feasibility of this faculty's rejoining the Financial Research Institute (FRI). Prof. Tomaski acted as intermediary with the Dean, Research Director, Computer Centre, and the other Departments (as they might also be interested in the FRI data base). Prof. Tomaski also circulated a memo (October 27, 1975) to all members of the Finance Department enquiring into their individual needs of the FRI data base for research and teaching. Prof. Pradhan acted as liaison with the FRI and (some) other universities using their system. The combined research of the task force is presented in the following report.

It is recognized that a significant demand for the FRI data base must come from teaching, as well as research, needs. Until the Ph.D. program is operational, this pedagogic demand must come principally from Finance 453 and Finance 695. It is, however, expected that students completing M.B.A. research papers will constitute a significant secondary source of demand for the FRI data base. Re Finance 453 and 695, it is interesting to note that the FRI offers twelve different portfolio management programs that could be employed in the instruction of these courses. (See exhibit 5 under the "System Costs and Details" section of this report.)

The task force regrets the length of time that it has taken to prepare this report, but feels that this was unavoidable. The Dean had suggested, wisely we felt, that our report contain an estimate of the total C.P.U. charges that we could expect to pay in using the FRI system, and it took some time to develop an estimate that we feel will prove to be reasonably accurate.

Recommendations:

The task force recommends, on the basis of the benefit and cost data reported below, that the Dean reactivate as soon as possible this faculty's membership in the FRI. The task force also recommends, in accordance with the FRI's wishes, that a Faculty - FRI liaison officer be appointed by the Dean, and that this appointee be Prof, Pradhan, who has been serving on the task force as the departmental FRI liaison and has gathered from the FRI the data appearing in the "System Costs and Details" section of this report.

Benefits:

Described below are benefits that are expected to derive from our renewed membership in the FRI.

Undergraduate Students:

1. FRI is necessary for Finance 453 (a course on Portfolio Management).

MBA Students:

1. FRI is necessary for many of the MBA research projects.

2. FRI is necessary for Finance 695 (a course on Investment Management).

Ph.D. Students:

1. FRI (or some machine-readable source of data) is necessary for Ph.D dissertations in Finance.

2. The lack of membership in FRI would have serious implications for our competitive position in the joint Ph.D. program.

All Students:

1. Without FRI, our graduates will continue to be at a competitive disadvantage after graduation. Most major financial institutions and quasi-public bodies as well as many large corporations use FRI, and they expect a graduate to be familiar with FRI. The graduates of most schools in this province do in fact enjoy the advantages of FRI membership, and, since ours do not, they are at a competitive disadvantage in the job market.

Faculty Recruitment:

1. It is essential to have access to a data base (FRI, Compustat, etc.) for the purposes of recruiting new faculty. Without such access it is extremely difficult to recruit (and retain) faculty members who are seriously interested in research.

Individual Faculty Research:

1. Some Department members feel seriously limited in the empirical research that they can undertake. At least three have also described the FRI data base as essential to thier Ph.D. dissertations.

2. Department members indicated that the FRI data base would be extremely useful, if not essential, to the completion of their research in the following areas:

   - The Detection of Stock Price Manipulation: A Residual Price/Volume Discriminant Analysis
   - The Efficacy of Security Regulation in Canadian Capital Markets
   - The Effect of Inflation on Portfolio Investment
   - The Effect of Personal Taxation on Portfolio Investment
   - Third Moment Effects and Portfolio Investment

These projects comprise both dissertation and non-dissertation research.

With respect to our comparative abilities to attract and retain the best faculty and students available in this region, and to develop into even an adequate research institution, it is interesting to note that we, as non-members of the FRI, are among a very small minority. The following universities in this province are FRI members:

- McGill University
- Université de Montréal (Hautes Etudes Commercials)
- Université de Sherbrooke
- Université du Québec (à Montréal, Rimouski, Rouyn-Noranda, and Trois-Rivières)
- Université Laval

Only the following are not members:

- Bishop's University
- Concordia University
- Université du Québec à Chicoutimi (assuming they do teach business there)

Note that Concordia is the only university in Quebec that both teaches business at the graduate level and does not belong to the FRI. Now that the joint Ph.D. program has arrived, this distinction is especially embarrassing. Note in particular that we are the only non-member university in Montreal.

System Costs and Details:

Prof. Pradhan has learned from the FRI that, because of complaints from member universities, the FRI has not, contrary to its original intent, implemented the fees which it had planned to begin charging universities for membership in the FRI. Thus, we can now join the FRI without any membership fees whatsoever.

Prof. Pradhan's research on FRI costs appears below, and includes (as exhibits 1 and 2) copies of the Music Usage Agreement and the Research Membership Agreement, which define the cost and other obligations of FRI membership.

Following the disucssion of costs there appears (as exhibit 3) the pamphlet "An Introduction to FRI", which describes the services that the FRI offers. Then appear (as exhibits 4 to 7) copies of the table of contents or preface to a number of manuals which describe the FRI data bases and program libraries, viz.:

- FP-FRI Financial Data File Definitions Manual
- FRI Portfolio Management Information System (PMIS)
- FRI Program to Manipulate Economic Data (ECORAX)
- FRI Bond Programs

In addition to these, the FRI List of Securities reports on those securities listed on the TSE, MSE, NYSE and AMEX, as well as many stock and bond indices. (Please refer to exhibit 3 and to the manuals described in exhibits 4 to 7 for a detailed description of the FRI and its data bases and programs.)

Membership Fees: The Financial Research Institute (FRI) does not charge membership fees to Research Members - i.e., universities and other academic institutions - at the present time. FRI plans for instituting fees for research members, effective October 1, 1976, were communicated to the latter in a letter from FRI President Richard Hamilton, on July 4, 1975. Following the protests of the research members, the FRI proposal stands in abeyance.

Computer Costs: At the present time, access to FRI data banks and processing facilities is available through the MUSIC computing service provided by the McGill University Computing Centre (MUCC). MUCC levies the following service charges:

For Connect Time

Weekdays, from 6:00 p.m. to 10:00 p.m., and Saturdays -- $1.00 per hour;

Weekdays, from 9:30 a.m. to 12 noon, and from 2:30 p.m. to 4:30 p.m. -- $5.00 per hour;

All Other Times -- $3.00 per hour.

For Terminal Input/Output

$0.50 per 1,000 characters.

For CPU Time

Weekdays, from 6:00 p.m. to 10:00 p.m., and Saturdays -- $10.00 per minute;

Weekdays, from 9:30 a.m. to 12 noon, and from 2:00 p.m. to 4:30 p.m. -- $16.00 per minute;

All Other Times -- $14.00 per minute.

Apart from these major categories of costs, MUCC charges also for ancillary services such as card reading, card punching, printing of outputs, and mounting of tapes and forms. Details of computing charges appear in a copy of the MUSIC Usage Aggreement, annexed to this memo. (Exhibit 1)

Estimate of Computing Costs for FRI Use by Faculty of Commerce:

The MUCC schedule of charges does not enable us to generate an estimate of the anticipated computing costs of FRI use by the Faculty of Commerce. A better guide for arriving at an estimate is the annual computing costs incurred for FRI use by other universities.

MUCC Director, Prof. Thorpe, has provided me with the figures of computing costs incurred by some university members of FRI, during the last year. These are as follows:

McGill University	$4,000
Ecole d'Hautes Etudes Commercials, Université de Montréal	4,000
Université de Sherbrooke	3,300
University of Western Ontario	1,500
University of Manitoba	1,000
Université du Quebec, Trois-Rivières	700

Prof. Thorpe stated to me that the computing costs of the three universities at the top of the list include a substantial proportion of costs on account of faculty research, supported by grants. In his judgment, the computing costs on account of student projects have not been large at these three universities.

On the basis of the information provided by Prof. Thorpe, my outside estimate of annual computing costs for student projects at this faculty, for the first year of FRI use, is $500. In addition, an estimate of $1,000 for annual computing costs for faculty research during the first year will not, in my opinion, be far off the mark.

My estimate of computer costs for FRI use during the six months of the current financial year, December 1, 1975 to May 30, 1976, is, therefore, $750. In anticipation of some increase in use of the facilities during the second year of operation, my estimate for the financial year 1976-77 is $2,000

FRI Takeover of Computer Processing: FRI is planning to take over from MUCC the processing facilities required for use of the FRI system, in the near future. The computing costs of FRI use, following the takeover, are not anticipated to be larger than the estimates developed earlier.

Terms of FRI Membership: The contract to be signed between the Faculty and FRI will be for a period of twelve months. It calls for proper credits to be given FRI for use of FRI data in any publication, and generally prohibits commercial use of projects involving use of FRI data, except without the written permission of FRI. A copy of the form of contract is annexed to this memorandum. (Exhibit 2)

Appointment of Responsible Official: FRI has stipulated that they prefer dealing with one official of the member institution, who shall be responsible for authorizing use of FRI codes by other individuals belonging to the member, and shall serve as the sole liaison between FRI and the institution. FRI undertakes to train this person, so that he/she may, in turn, train others in the use of FRI facilities. FRI will give account codes, to be controlled by this person, so as to prevent unauthorized use. FRI will also provide all documentation, necessary for use of the public facilities.

Compustat Data Bank: Access to the Compustat data bank is available to members of FRI, through special arrangements negotiated by FRI with Compustat, on behalf of the member. FRI has successfully negotiated such arrangements in the past, for use of Compustat data by research members for non-commercial purposes.

EXHIBIT 1

MCGILL UNIVERSITY COMPUTING CENTRE

MUSIC USAGE AGREEMENT FOR IBM 370 MODEL 158 (COMMERCIAL)

By acceptance hereof, McGill University Computing Centre agrees to furnish computing services to:

_____

_____

_____

Tel. no.: _____

who in turn agrees to accept 75 % of the charges outlined below, subject to the terms and conditions on the face and reverse side of this agreement, for the following user code: _____.

SERVICE CHARGES

Weekdays	Connect Time*	Terminal Input/Output	CPU Time
8:15 - 9:30 a.m.	$3 per hour	$0.50/10,000 characters	$14 per minute
9:30 - 12:00 noon	$5 per hour	$0.50/10,000 characters	$16 per minute
12:00 - 2:00 p.m.	$3 per hour	$0.50/10,000 characters	$14 per minute
2:00 - 4:30 p.m.	$5 per hour	$0.50/10,000 characters	$16 per minute
4:30 - 6:00 p.m.	$3 per hour	$0.50/10,000 characters	$14 per minute
6:00 - 10:00 p.m.	$1 per hour	$0.50/10,000 characters	$10 per minute
Saturday			
8:00 - 3:00 p.m.	$1 per hour	$0.50/10,000 characters	$10 per minute

(This rate is also effective for any other times, not given above, when the system is operational.)

* Connect time rates are specified for terminals operating at up to 30 characters per second. Connect time rates for faster terminals will be quoted upon request.

For batch jobs submitted at the Computing Centre, cpu time will be charged as above, but the following rates will be applied instead of connect time and terminal input/output:

Job Set Up	$0.60
Card Reading	$0.65/1000 cards
Card Punching	4.00/1000 cards
Printing	1.10/1000 lines
1 part form	
Mounting Charges:	
Magnetic Tape	$1.50
Special Forms	$1.00

SECONDARY CHARGES

Disk space utilised for on-line system storage of programs and data (Save Library) will be charged at the rate of .10 per week for approximately 3000 bytes, including daily backup.

User datasets, with a capacity of approximately 12000 bytes per track, are available for longer term use. The rate is .20 per track per week with daily backup, .12 per track per week without backup.

NO MINIMUM CHARGE

EXHIBIT II

FINANCIAL RESEARCH INSTITUTE

RESEARCH MEMBERSHIP AGREEMENT

Date: _____

Member: _____

Address: _____

_____

_____

Telephone: _____

Category of Membership: RESEARCH MEMBER

Membership Contribution: WAIVED FOR RESEARCH MEMBER

The Terms of Membership herein described are accepted for the Member by:

Member Representative: _____

Signature: _____

This Membership Agreement shall take effect on the date shown above and shall continue in force for a period of twelve (12) months. A member firm shall be deemed to have renewed its membership for additional terms of twelve (12) months each unless written notice is received at least thirty (30) days prior to the end of any twelve (12) month term advising the Institute of its decision not to renew its membership.

FRI facilities are made available to Research Members for research and project work that is considered in the public domain. Any reports, theses or publications using this data must give proper credits for the use of the data and a copy sent to FRI. Please check with FRI for the proper information about credits when the need arises.

FRI facilities may not be used for consulting work or any other outside activity unless prior arrangements are made with FRI and written approval received.

FINANCIAL RESEARCH INSTITUTE

TERMS OF MEMBERSHIP

Membership shall be governed by the By-Laws of the Institute and in addition the terms and conditions that follow:-

GENERAL TERMS

1. All data and manipulated data from FRI data banks and output from FRI programs may be printed and distributed free of charge by FRI members in any form except a computer readable form but FRI and The Dominion Bureau of Statistics, if applicable, should be credited when publishing any part of it.

2. No direct charge may be made for any statistical study or report which is primarily based on FRI data or output from FRI programs without first obtaining permission in writing from FRI.

3. FRI members may not allow non-members to have access on the computer to FRI data banks and programs. Also, FRI members may not allow other members to have access to programs or data to which they are not entitled under their class of membership.

4. Members may not provide portfolio pricing based on FRI data banks to non-members on a basis more frequent than every six (6) months. Portfolios managed by the member are exempt from this restriction.

DATA

1. FRI staff will make every effort to provide accurate and timely data and to expand present and future data areas. But FRI cannot guarantee complete accuracy of data or timeliness and cannot be held responsible for any loss or damage caused by data problems.

2. No data or copies of data from FRI's data bank may be taken from the computer in a machine readable form such as paper tape or magnetic tape and transferred to another computer without first obtaining written permission from FRI.

FINANCIAL RESEARCH INSTITUTE

TERMS OF MEMBERSHIP

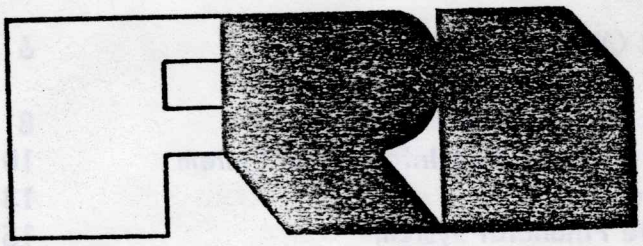
FRI PROGRAMS

1. The programs made available to FRI members fall into three categories. Those produced by FRI staff, programs and sub-programs made available by the McGill Computing Centre and members' programs which are made available to other members. Only the programs developed by FRI staff are fully documented and supported by FRI. However, FRI staff will offer assistance to members to make use of other programs.

2. All FRI programs are fully tested before being released for use by members. FRI believes the programs described in the program documentation supplied to members to be accurate and reliable and a great deal of care has been taken in their preparation. However, FRI cannot accept any responsibility, financial or otherwise, for any consequences arising out of the use of the programs or program descriptions. The information contained in manuals and program descriptions is subject to change. FRI will make every effort to give ample notification of any significant changes which could affect the user in any way.

EXHIBIT III

AN INTRODUCTION TO



July, 1973

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1. INTRODUCTION

The purpose of the Financial Research Institute (FRI) is to provide the Canadian business and financial community with computational, research and educational support for financial and economic analysis at a level equal or superior to that of the largest North American firms. In centralizing these activities, the FRI can achieve considerable economies of scale, which directly benefit FRI member firms. These same facilities are made available at much reduced costs to Canadian universities in support of graduate studies and advanced research.

To achieve that purpose, the FRI was organized as a non-profit corporation, to be managed and controlled by its member firms and cooperating universities. It was formed in 1968 by the McGill Graduate School of Business (now the Faculty of Management) and ten founding member firms located in Montreal and Toronto. FRI membership now includes banks, brokerage houses, trust companies, insurance companies, mutual funds, government institutions, industrial firms, and many Canadian universities.

FRI has the proven ability to apply new and rapidly developing computerized data bank techniques to management information systems, analysis, and research. Data banks and programme packages have been produced by FRI to do financial and economic analysis, forecasting, portfolio management and technical analysis on the computer. It provides the staff training and support needed for FRI members to make effective use of these facilities. In addition, systems design and programming services are offered at minimum cost for members wishing to develop special applications programmes using their own or FRI data banks. In these ways, FRI successfully acts as an extension of the research and portfolio management activity of its member firms.

2. BACKGROUND TO FRI

2.1. DATA BANKS AND PROGRAMME LIBRARY

The FRI maintains a number of computerized data banks or files for the use of its member firms. Some of these are provided under contract by outside sources and some have been developed by FRI. At present, FRI data banks serve three main areas:

FINANCIAL ANALYSIS
ECONOMIC ANALYSIS
PORTFOLIO MANAGEMENT

A certain amount of data is also available for technical analysis and more will be added in the near future. In all, over 185,000 data series are maintained on the computer and can be instantly accessed and manipulated using FRI library programmes or members' private programmes. The data bank is growing constantly and when sufficient interest is shown, whole new sections are added. For example, the Bonds data and Canadian Chartered Banks data and related software systems have been developed to meet the growing needs of FRI members.

FRI has played a leading role in developing software packages for data banks. Readily available through time sharing, the easy-to-use conversational programmes in FRI's library provide for quick and easy data access and manipulation. The programmes available, which are constantly increasing in number, enable the user to access data and do everything from simple calculations and report generation to screening of data, regression analysis, forecasting of inter-related time series and portfolio valuations.

A member's private data and programmes stored on the system are held in confidence and are subject to strict security precautions. No access may be obtained to a member's files or programmes by another member without the former's written permission. Security may even be enforced within a single company, via the use of unique passwords through which the internal distribution can be controlled.

2.2 SUPPORT

FRI provides staff training and continuing full support for members' use of programmes, data banks, and computer facilities whether they are using a computer for the first time or are highly experienced.

A complete set of detailed documentation is provided to members for use of all data banks and programmes.

Members' meetings and seminars are held on subjects of mutual interest.

Periodic reviews are made with individual members to discuss new programmes or data and specific applications.

In addition to complete support of existing facilities and continued development, FRI offers its members systems design and contract programming services at minimal rates.

Should large volume output be required, FRI personnel interface directly with the McGill Computing Centre facilities and so can arrange to administer to a member's remote high-speed printer requirements.

2.3. EDUCATION AND RESEARCH

Education and research, together, will provide the main solution to the long-run competitive problems of the Canadian financial community. Enhancements in these areas constitute the major goal of the FRI. This goal is stated in By-Law Two of the Institute's Articles of Incorporation, as follows:

> "The purpose and objectives of the Institute shall be to foster the knowledge and understanding of all quantitative aspects of financial analysis as related to securities investments and portfolio management and to economic and other matters related thereto, and to sponsor, aid, and encourage research, application, education and informatory activities in the furtherance of these purposes."

It has been widely recognized that the main obstacle to the adoption of the new, more sophisticated, quantitative approaches to financial and economic analysis has been a shortage of people who understand and can use these new techniques. Primarily for this reason, it was decided that the FRI must involve an amalgamation of services, education, and research facilities. The university members offer courses and seminars and carry out research based on FRI facilities. Workshops are held regularly in addition to the FRI Members' Meetings. FRI conducts seminars on analysis and use of data banks and the various FRI programmes. The McGill Computing Centre offers courses in programming and holds regular meetings to discuss the Computing Centre facilities.

Membership in the FRI greatly increases the educational and research capabilities of both member firms and cooperating universities. The research and service facilities of the FRI are made fully available at very low cost to member universities and provide on-going support for the great surge of interest which has developed recently in quantitative analysis in finance, economics and portfolio management. This is reflected in the research interests of faculty and graduate students at universities and in the career interests of graduating students.

2.4 FRI COMPUTER FACILITIES

FRI is a Montreal-based company with a single branch office located in Toronto.

All FRI members, regardless of geographic location, have the use of the McGill University Computing Centre through the FRI. The two main computer systems are the IBM/370-158 and the IBM/360-75. Through terminals located in their own offices, FRI members are able to avail themselves of a time-sharing service called MUSIC (McGill University System for Interactive Computing) which operates throughout the day on the /370-158. MUSIC also supports a batch facility for large volumes of output via on-site high speed printers. Members wishing to interface with the actual Computing Centre may do so directly or can arrange to have qualified FRI personnel act on their behalf. MUSIC is now being accessed by FRI members in Montreal, Sherbrooke, Ottawa, Toronto, Waterloo, Hamilton, London and Winnipeg.

FRI maintains a network of computer communication lines between Toronto and Montreal to allow Toronto members access to the McGill computer system on an equal cost basis with Montreal members. Members outside these centres are responsible for the cost of communication lines to the nearer of the two cities. With the introduction by the Trans-Canada Telephone System of the DATAROUTE service in the summer of 1973, the cost of lines from another city in Canada has been reduced substantially.

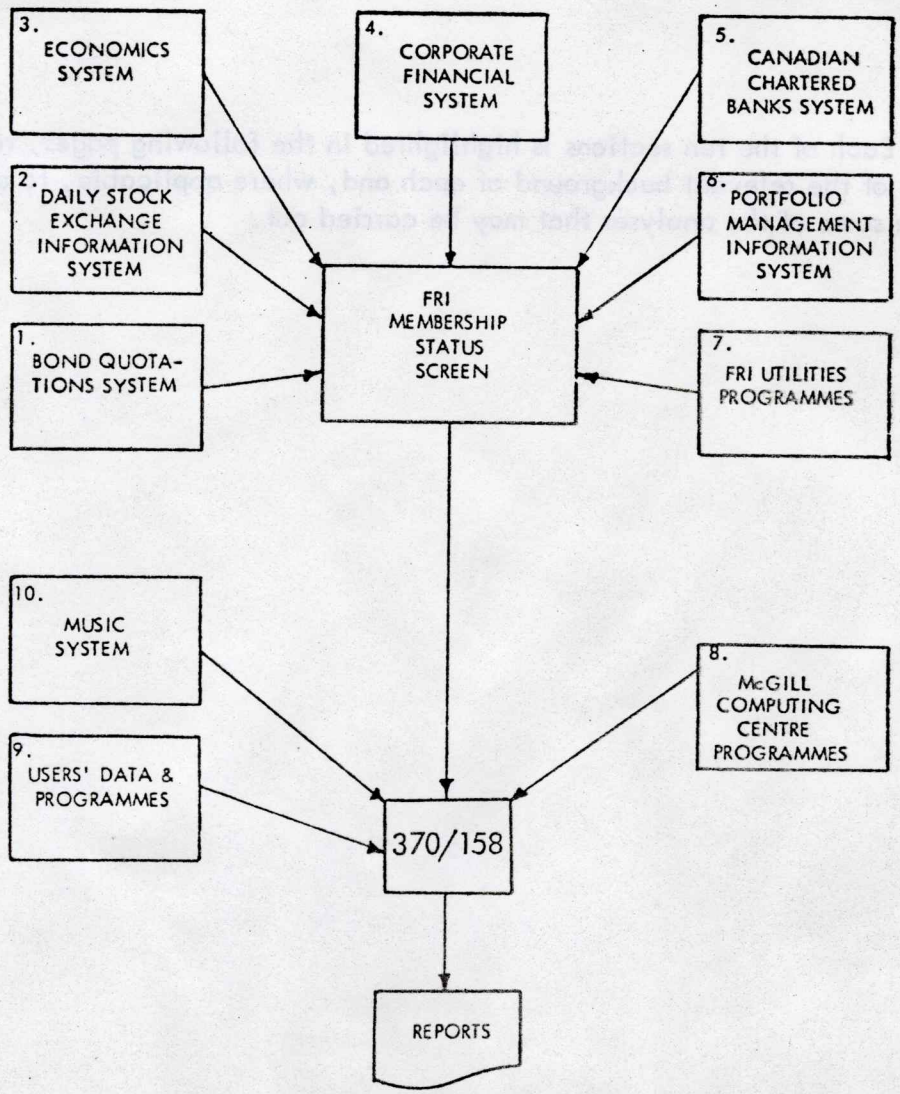
All of FRI's data and programmes are continuously on the system on equipment leased specifically for this purpose. Members' private data and programmes are also stored on the system and are under tight security.

Terminals may be either purchased outright or rented directly from suppliers such as IBM or Bell Canada. There is a large variety from which to choose and the final choice usually depends on a member's specific requirements. The McGill Computing Centre, equipment suppliers, and FRI may be consulted in arriving at a decision.

3. DESCRIPTION OF FRI SYSTEMS

At present, the FRI data bank consists of five major sub-sections (boxes 1 through 5 below), each being supported by its own unique conversational software, as well as programmes which handle standard or generalized computations not necessarily related to any data bank. A schematic diagram (below) illustrates how an FRI member interfaces with the FRI data banks and the McGill time-sharing system. Since membership to FRI can be full or partial, a member's sign-on identification is screened to determine his access rights.

THE FRI DATA BANK SYSTEM



The following table links member status and access rights.

MEMBERSHIP STATUS	PERMITTED DATA AND PROGRAMME ACCESS
Full	1 through 10
Partial - Economics	3,7,8,9,10
- Corporate Finance	4,5,7,8,10
- Banks	5,7,8,9,10
- Portfolio	1,2,6,7,8,9,10

Each of the ten sections is highlighted in the following pages, to give an idea of the relevant background of each and, where applicable, to demonstrate some of the analyses that may be carried out.

3.1. BOND QUOTATIONS SYSTEM

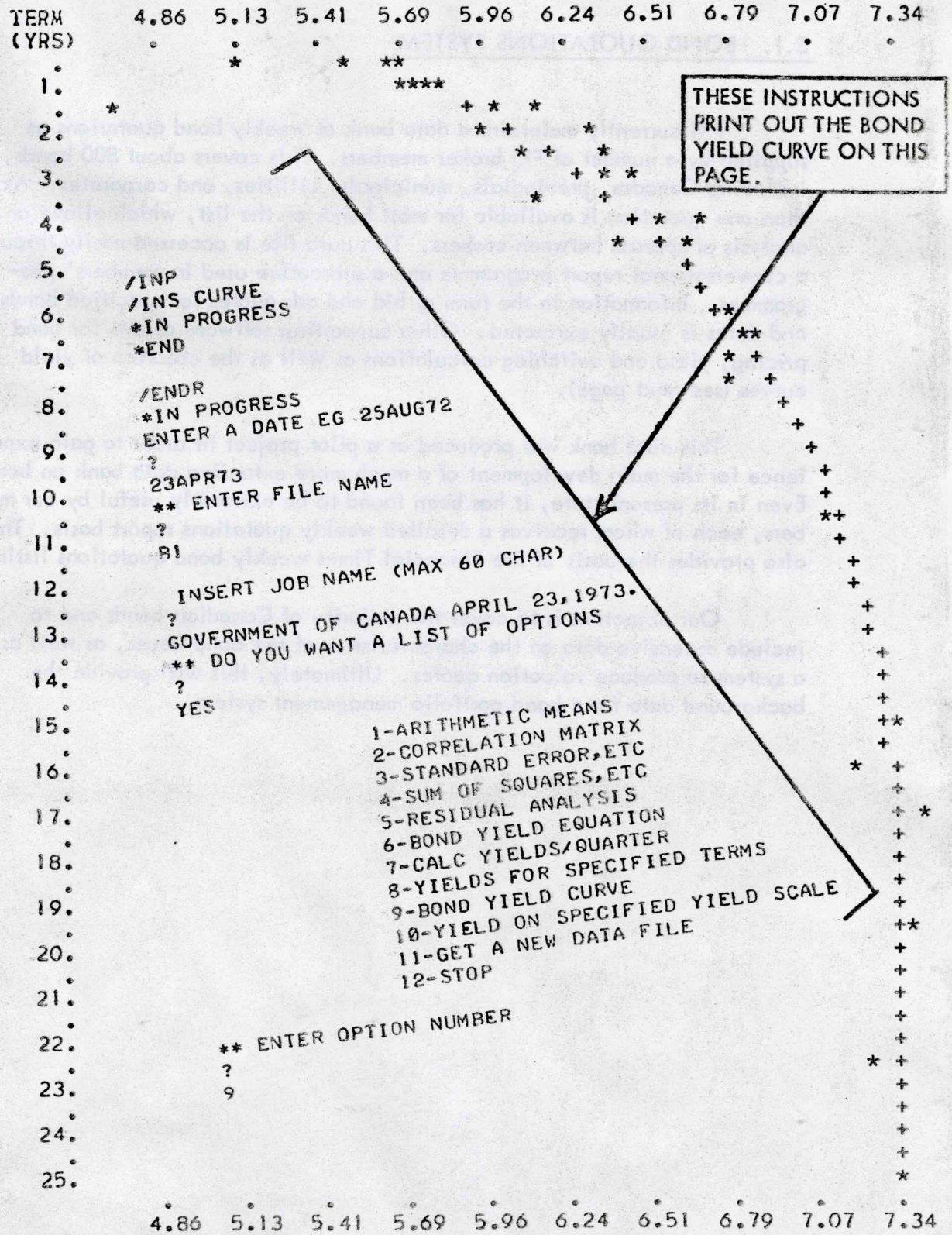
FRI currently maintains a data bank of weekly bond quotations as supplied by a number of FRI broker members. This covers about 800 bonds, including Canadas, provincials, municipals, utilities, and corporates. More than one quotation is available for most bonds on the list, which allows an analysis of spreads between brokers. This data file is accessed easily through a conversational report programme and a subroutine used in members' programmes. Information in the form of bid and ask quotes for specified bonds and dates is usually extracted. Other supporting software allows for bond pricing, yield and switching calculations as well as the creation of yield curves (see next page).

This data bank was produced as a pilot project in order to gain experience for the main development of a much more extensive data bank on bonds. Even in its present state, it has been found to be extremely useful by our members, each of whom receives a detailed weekly quotations report basis. The data also provides the basis of the Financial Times weekly bond quotations listing.

Our objective is to cover the majority of Canadian bonds and to include extensive data on the characteristics of the bond issues, as well as a system to produce valuation quotes. Ultimately, this will provide the background data for a bond portfolio management system.

GOVERNMENT OF CANADA APRIL 23,1973.

\+ YIELD-CALCULATED
* YIELD-OBSERVED



THESE INSTRUCTIONS PRINT OUT THE BOND YIELD CURVE ON THIS PAGE.

```
/INP
/INS CURVE
*IN PROGRESS
*END

/ENDR
*IN PROGRESS
ENTER A DATE EG 25AUG72
?
23APR73
** ENTER FILE NAME
?
B1

  INSERT JOB NAME (MAX 60 CHAR)
?
GOVERNMENT OF CANADA APRIL 23,1973.
** DO YOU WANT A LIST OF OPTIONS
?
YES

                1-ARITHMETIC MEANS
                2-CORRELATION MATRIX
                3-STANDARD ERROR,ETC
                4-SUM OF SQUARES,ETC
                5-RESIDUAL ANALYSIS
                6-BOND YIELD EQUATION
                7-CALC YIELDS/QUARTER
                8-YIELDS FOR SPECIFIED TERMS
                9-BOND YIELD CURVE
                10-YIELD ON SPECIFIED YIELD SCALE
                11-GET A NEW DATA FILE
                12-STOP

        ** ENTER OPTION NUMBER
        ?
        9

** ENTER OPTION NUMBER
?
12
```

3.2. DAILY STOCK EXCHANGE INFORMATION SYSTEM

The Daily Stock Exchange data bank covers all of the listed issues on the Toronto (TSE), Montreal-Canadian (MSE), New York (NYSE), and American (AMEX) Stock Exchanges. This represents over 6,500 issues. It extends back daily to June 1969 and includes high-low prices, split factors, and dividends, in addition to the closing price and volume of each security.

Data for the previous day's trading is available by 9:00 a.m. daily. It is received at the close of each day's trading and is carefully edited to assure that it is well within acceptable quality standards. Data is directly accessed by several report programmes and subroutines used in members' programmes. In general, the FRI programmes can be used to:

- extract price and volume data for given securities on a given day.
- extract price and volume data for a given security over a period of time.
- create private user-specified data files to meet individual requirements.
- create reports or permanent data files adjusted for stock splits.
- rank securities vis à vis the percentage changes in prices between any two dates.
- produce high-low traces on selected securities over 90-day intervals.

A monthly prices file, which consists of month-end prices, adjusted for splits, has been given to FRI by Bell Canada. 99 TSE stocks and the TSE Industrial Index are available from January 1959. FRI has accepted maintenance of the file since January 1970. Data is accessed through a subroutine used in members' programmes.

A sampling of some outputs from the Stock Market Prices and Volumes Data Bank is offered: eg.....

PERFORMANCE RANKING

```
ENTER DATES REQUIRED... E.G. 06MAR72,07MAR72
?
13JUN73,14JUN73
ENTER ONE EXCHANGE
1-FOR NYSE,2-FOR AMEX
3-FOR MTL-CDN,4-FOR TSE
?
1
ENTER SECURITY TYPE OR TYPES DESIRED---
1 FOR COMMON, 2 FOR PREF,3 FOR  WARRANTS
EG 1 2 3
?
1
MIN PRICE,MIN $VOL,NUMBER OF STOCKS(MAX 200)
EG 5.0 0.0 50
?
1.0 0.0 15
TOP  15 OR BOTTOM  15
?
BOTTOM
```

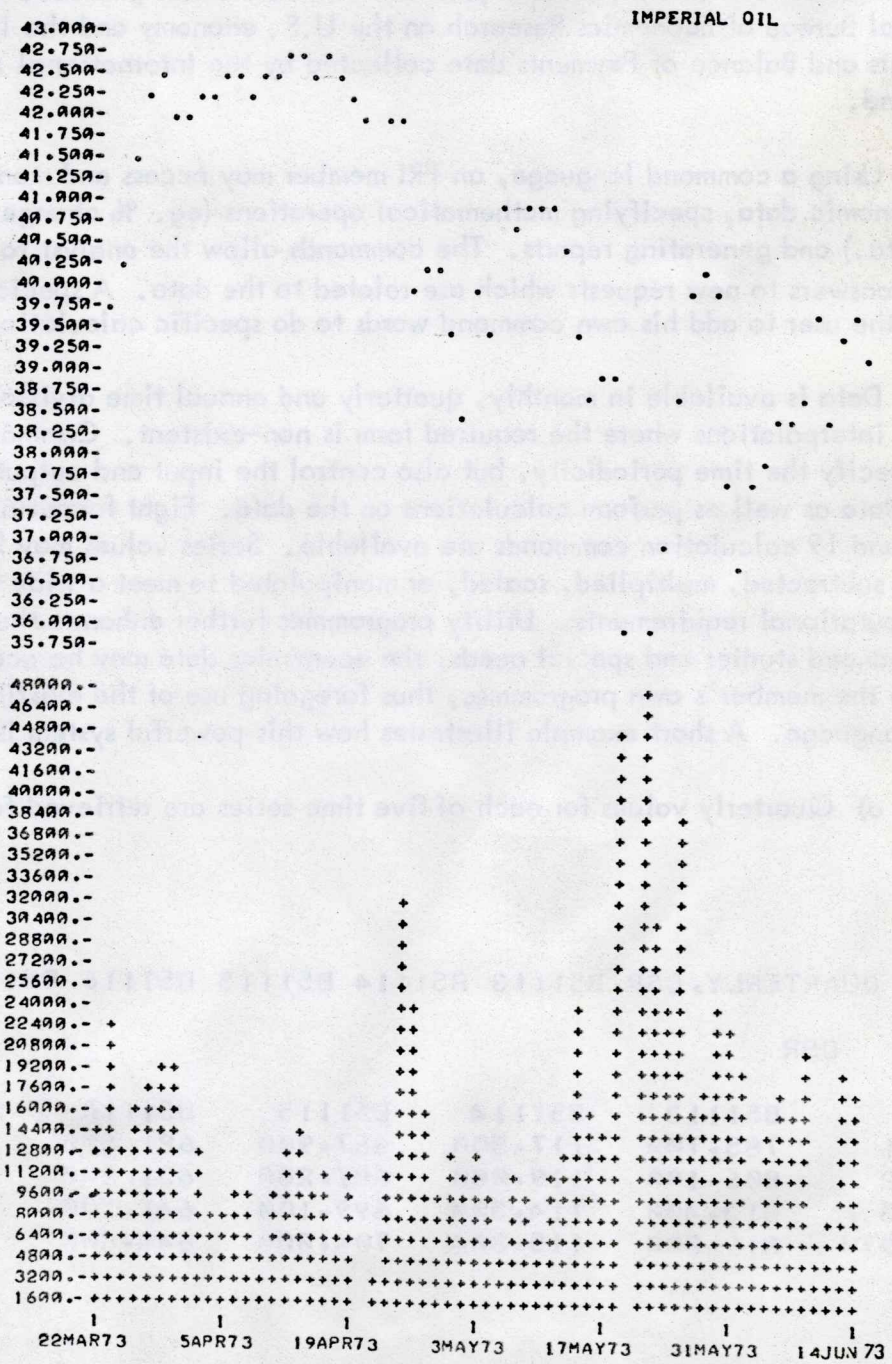
15 TOP LOSERS
RANKED ON PCT-CHANGE IN PRICE

PERIOD COVERED IS 13JUN73 TO 14JUN73
EXCHANGES COVERED ARE NYSE
SECURITY TYPES ARE COMM

COMPANY NAME	PCT CHANGE	13JUN73 PRICE ($.00)	13JUN73 VOL (000)	14JUN73 PRICE ($.00)	14JUN73 VOL (000)	DOLLAR VOLUME ($000)	PRICE REL
CULLIGAN INC	-12.50	12.00	0.10	10.50	23.10	242.550	0.88
WALMART	-12.14	17.50	97.60	15.38	4.80	73.800	0.89
FOOTE MINERL	-11.36	5.50	1.50	4.88	10.20	49.725	0.90
COPPER RANGE	-10.45	16.75	7.60	15.00	8.00	120.000	0.91
BARD C. R.	-10.09	27.25	3.60	24.50	12.40	303.800	0.91
WHITTAKER CO	-10.00	3.75	13.10	3.38	55.10	185.962	0.91
MILTON BRADL	-9.35	13.38	11.80	12.13	17.30	209.762	0.92
BAKER IND	-9.14	23.25	0.80	21.13	3.80	80.275	0.92
INTRST STORS	-9.09	2.75	17.20	2.50	11.50	28.750	0.92
ELIXIR INDS	-9.09	5.50	7.90	5.00	10.20	51.000	0.92
SAFEWAY	-8.88	32.38	32.90	29.50	16.10	474.950	0.92
SPERRY HUTCH	-8.81	19.88	2.80	18.13	11.60	210.250	0.92
GEN MEDICAL	-8.24	21.25	1.00	19.50	7.20	140.400	0.93
PUEBLO INTL	-8.11	4.63	1.00	4.25	1.40	5.950	0.93
MERRIL LYNCH	-7.87	15.88	19.00	14.63	23.00	336.375	0.93

PRICE AND VOLUME TRACE ON A SECURITY

```
/INPUT
/INSERT GRAPHS
*IN PROGRESS
*END

/ENDRUN
*IN PROGRESS

TYPE IN TICKER  E.G. IMOT
?
IMOT
TYPE IN FINAL DATE , 2 DATES OR SOS. E.G. 01MAR73 OR 05DEC72,01MAR73.
?
14JUN73
```



3.3 ECONOMIC SYSTEM

The economic data includes about 9,000 Canadian socio-economic data series supplied by Statistics Canada and the Bank of Canada. Included with the Bank of Canada data are about 200 series on the U.S. economy. The Statistics Canada data includes all the series published in the Canadian Statistical Review, the Industrial Corporations Financial Statistics, as well as the new detailed and revised National Accounts data. The balance of the 30,000 data series available on CANSIM can be provided for members on short notice.

Also available on special request are the data series produced by the National Bureau of Economics Research on the U.S. economy and the National Accounts and Balance of Payments data collected by the International Monetary Fund.

Using a command language, an FRI member may access and manipulate the economic data, specifying mathematical operations (eg. % change, growth rate, etc.) and generating reports. The commands allow the analyst to quickly obtain answers to new requests which are related to the data. A special feature allows the user to add his own command words to do specific calculations.

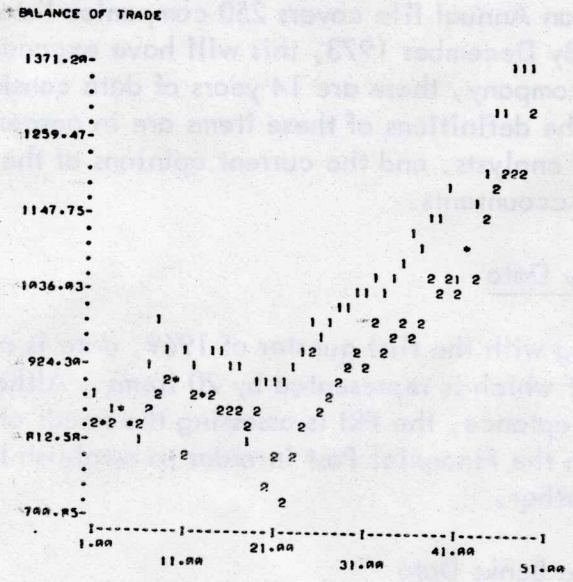
Data is available in monthly, quarterly and annual time divisions with default interpolations where the required form is non-existent. Commands not only specify the time periodicity, but also control the input and output forms of the data as well as perform calculations on the data. Eight formating commands and 19 calculation commands are available. Series values may be added, subtracted, multiplied, scaled, or manipulated to meet a wide range of computational requirements. Utility programmes further enhance the system. For advanced studies and special needs, the economics data may be accessed through the member's own programmes, thus foregoing use of the existing command language. A short example illustrates how this powerful system is used:

a) Quarterly values for each of five time series are retrieved for 1970.

```
?

PRINT QUARTERLY,CSR,B51113 B51114 B51115 B51116 B51117,1970.

      CSR

          B51113     B51114     B51115     B51116     B51117
Q1        785.700    117.800    667.900    621.600     46.300
Q2        806.100    119.000    687.200    631.200     55.900
Q3        813.400    114.300    699.100    641.100     58.000
1970      819.800    115.800    704.000    644.800     59.200
```

When the economics data is combined with other FRI software features such as plot routines, the results can be quite dramatic. Below, one of the utility routines has been used to plot Canadian merchandise trade with the U.S. Exports are designated "1"; imports are "2"; coincident points are marked "*". The plot is by months from March 1969 to March 1973.

```
ENTER TITLE
?
BALANCE OF TRADE
ENTER SAVE FILE NAME
?
TUPLT
HOW MANY VARIABLES ARE IN THE SAVE FILE?
?
2
TYPE NUM.OF COLUMNS,NUM.OF LINES,KEYWORDS..OR SOS
?
49 30 TIME .
```



b) Another command is used such that the first series becomes the divisor for each of the other series.

```
?
RELATIVE QUARTERLY,CSR,B51113 B51114 B51115 B51116 B51117,1970.
```

CSR

	B51114	B51115	B51116	B51117
Q1	0.150	0.850	0.791	0.059
Q2	0.148	0.852	0.783	0.069
Q3	0.141	0.859	0.788	0.071
1970	0.141	0.859	0.787	0.072

3.4. CORPORATE FINANCIAL SYSTEM

This section of the FRI data bank covers Canadian and American company data. All files are carefully edited for accuracy and updated promptly upon release to the public of new information. The data may be subdivided into six parts. i.e.....

Canadian Annual Data

The Financial Post Computer Services and the FRI have entered into an agreement to work together to produce a comprehensive data file of fundamental financial data on Canadian companies. The file includes both annual and quarterly data and is referred to as the FP-FRI data file.

The Canadian Annual file covers 250 companies listed on Canadian stock exchanges. By December 1973, this will have expanded to 400 companies. For each company, there are 14 years of data consisting of 88 basic financial items. The definitions of these items are in agreement with leading Canadian financial analysts, and the current opinions of the Canadian Institute of Chartered Accountants.

Canadian Quarterly Data

Commencing with the first quarter of 1969, data is available for 80 companies, each of which is represented by 20 items. Although the file is now in general acceptance, the FRI is assessing the needs of its membership and consulting with the Financial Post in order to establish how this file is to be developed further.

Canadian Chartered Banks Data

This file includes data on each of the Canadian Chartered Banks. It includes the weekly statements published by the Bank of Canada, the monthly statement of Assets and Liabilities from the Department of Finance, and the quarterly and annual reports of the individual banks. This file also includes selected interest rate series, and a number of important Bank of Canada series. Since it is possible to subscribe to a partial membership for this file alone, all further descriptions and particulars are presented in section 3.5.

American Annual Data

This section covers 1800 U.S. companies. For each company there are 11 years of data consisting of 61 basic financial items. This is part of the COMPUSTAT file produced by Investors Management Sciences, a division of Standard and Poor's Corporation.

American Quarterly Data

This section covers the same 1800 U.S. companies as the Annual file. For each company there are 20 quarters of data consisting of 26 basic items and footnotes. This file is also part of the COMPUSTAT service.

American Utilities Data

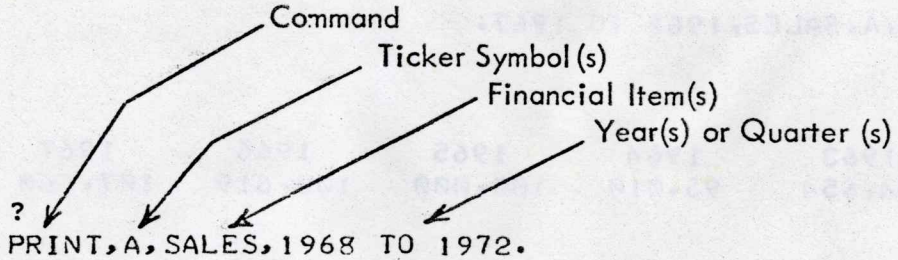
This section covers 152 U.S. utility companies. For each company there are 11 years of data consisting of 61 basic financial and production items. This is also part of the COMPUSTAT service.

GENERAL SOFTWARE

The software which permits a member to interface with the financial data (all sections except the Canadian Chartered Banks) may be summarized as belonging to one of four main types. i.e.....

a) Access and Manipulation of Data

A language using English word commands to specify mathematical operations, including such things as ranking and growth rate calculations, provides a highly flexible means of generating reports. An analyst can easily and quickly obtain answers to new requests related to the data. The basic instruction consists of four components i.e...



A

	1968	1969	1970	1971	1972
SALES	255.588	287.000	283.947	279.434	307.751

Report formats may be modified with a set of command modifiers as shown in the example below (note that the criteria now constitute the main heading):

```
?
PRINT CRITERIA,A B N,SALES TOTASS,1963 TO 1967.
```

SALES

	1963	1964	1965	1966	1967
A	164.576	184.709	194.411	211.167	209.303
B	502.977	542.772	592.961	645.047	702.036
N	466.807	572.070	634.807	694.122	713.157

TOTASS

	1963	1964	1965	1966	1967
A	212.516	229.656	265.976	264.210	286.623
B	1861.777	2019.313	2122.367	2459.833	2651.549
N	809.592	898.483	986.839	1022.793	1115.659

Many calculations may be performed by more than 15 basic commands to which the user may add his own. As a simple illustration, we wish to look at sales for Abitibi for the period 1963-67. 1965 is set as base year and all other years become ratios relative to 1965 by use of the following command:

```
BASE YEAR 1965,A,SALES,1963 TO 1967.
```

A

	1963	1964	1965	1966	1967
SALES	84.654	95.010	100.000	108.619	107.660

b) Analysis Via Screening, Ranking, Merging, Etc.

There also exists an analysis programme which allows the user to access the financial data, do screening and ranking on important parameters, create industry composites, and produce reports on any of the financial items or calculated results derived from the data bank. This software applies to the Canadian and U.S. annual data. The following example illustrates its conversational aspects, calculational abilities, and report features.

A screen and rank is carried out in a single run. The screen is first performed on all companies in the Canadian Annual data file with Sales (item 28) over $1,000,000 and a 5 year growth in earnings per share (item 9929) over 40%. The screen is performed on data from the latest year of the study (i.e.1972) which runs over the period 1968-1972. Ranking is on 5 year growth in EPS, also on data of the last year. Page 1 of the output lists those companies surviving the screen; Page 2 gives in descending order the 5 year growth in EPS; and Page 3 shows the supporting Sales information. The conversational input is shown below while output follows on the next page.

INPUT TO TYPICAL SCREENING AND RANKING STUDY

```
/inp
/ins panny
*IN PROGRESS
*END
/endr
*IN PROGRESS
PLEASE NOTE: THIS IS THE NEW PANNY, AND TICKER SYMBOLS ARE TO BE ENTERED INSTEAD
OF COMPANY NUMBERS IN REPLY TO THE QUESTION .. WHICH COMPANIES?
ENTER OPTIONS OR SOS
?
rank screen
WHICH COMPANIES?
?
all
WHICH CRITERIA?
?
9929 28 9999
RANKING CRITERION?
?
9929 over 0. 9999
WHICH SCREENING CRITERIA AND CONDITIONS?
?
9929 over 40. 28 over 1. 9999
NUMBER OF YEARS + LATEST YEAR,EG 3 72
?
05 72
BY 'CRITERIA',OR 'COMPANY'?
?
criteria
TITLE ?
?
ranked on high earnings growth rate
SET TO NEW PAGE AND HIT CTL-Q
```

TYPICAL OUTPUT OF A RANKING AND SCREENING STUDY

RANKED ON HIGH EARNINGS GROWTH RATE

PAGE 1
14FEB74

1 BRIT. COLUMBIA PACKERS
2 CONSUMERS DISTRIBUTING
3 ELECTROHOME LTD.
4 GRAFTON GROUP LTD.
5 GREAT WEST STEEL INDUST.
6 LAIDLAW MOTORWAYS LTD.
7 MITCHELL ROBT - CL B
8 NAT'L DRUG&CHEMICAL CO.
9 NATIONAL SEA PRODUCTS
10 SCOTT'S RESTAURANTS
11 ST.LAWRENCE CEMT.-CL A
12 STANDARD INDUSTRIES
13 VULCAN INDUSTRIAL PKG

RANKED ON HIGH EARNINGS GROWTH RATE

PAGE 2 — 5YR GTH EPS BEF XTRAS
14FEB74

		1972	1971	1970	1969	1968
1	BRIT. COLUMBIA PACKERS	132.25	62.24	27.21	-5.28	-16.50
2	NATIONAL SEA PRODUCTS	130.81	69.88	23.79	-3.47	-29.86
3	CONSUMERS DISTRIBUTING	75.70	100.06	176.15	199.39	NA
4	ELECTROHOME LTD.	59.00	52.49	38.59	27.47	-1.57
5	LAIDLAW MOTORWAYS LTD.	57.79	42.23	38.29	NA	NA
6	GRAFTON GROUP LTD.	48.52	NA	) NA	NA	NA
7	MITCHELL ROBT - CL B	47.60	63.41	39.70	NA	NA
8	NAT'L DRUG&CHEMICAL CO.	46.68	NA	NA	NA	NA
9	SCOTT'S RESTAURANTS	45.85	56.96	53.03	49.91	NA
10	ST.LAWRENCE CEMT.-CL A	44.42	11.83	-8.31	-13.95	-13.06
11	VULCAN INDUSTRIAL PKG	42.49	76.56	65.01	58.17	8.75
12	GREAT WEST STEEL INDUST.	42.49	52.85	NA	NA	NA
13	STANDARD INDUSTRIES	41.20	51.20	15.54	-0.12	-9.74

RANKED ON HIGH EARNINGS GROWTH RATE

PAGE 3 — SALES (NET)
14FEB74

		1972	1971	1970	1969	1968
1	BRIT. COLUMBIA PACKERS	110.93	97.51	89.37	93.17	86.82
2	NATIONAL SEA PRODUCTS	69.32	63.36	64.95	61.89	57.78
3	CONSUMERS DISTRIBUTING	55.79	42.92	31.22	15.13	9.97
4	ELECTROHOME LTD.	88.01	69.75	50.07	44.50	35.65
5	LAIDLAW MOTORWAYS LTD.	21.77	13.56	10.02	5.66	3.48
6	GRAFTON GROUP LTD.	54.41	48.88	42.00	36.15	25.22
7	MITCHELL ROBT - CL B	19.06	19.95	18.46	16.02	14.52
8	NAT'L DRUG&CHEMICAL CO.	100.40	91.79	85.57	84.01	77.13
9	SCOTT'S RESTAURANTS	46.10	38.18	30.02	18.81	11.88
10	ST.LAWRENCE CEMT.-CL A	70.72	67.75	49.38	45.37	45.06
11	VULCAN INDUSTRIAL PKG	8.46	7.71	6.74	6.12	5.57
12	GREAT WEST STEEL INDUST.	31.34	22.61	15.74	11.72	6.18
13	STANDARD INDUSTRIES	53.38	45.25	39.86	39.65	42.87

ANYMORE ?
?
no

c) Standard Report Outputs

Another software feature allows a user to extract corporate financial data in normal accounting statement formats. Report outputs are pre-specified, leaving no onus on the user of the system. Common reports such as Income Statements, Balance Sheets, Per Share Statistics, etc. are available for companies in the U.S. and Canadian Annual Files.

d) Raw Data Access

In certain situations, it may be desirable to access the data bank directly from a user's own programme: subroutines exist which permit this freedom to those users with programming experience.

3.5 CANADIAN CHARTERED BANKS SYSTEM

As mentioned in section 3.4, access to the Banks data file may be obtained without subscription to the full Corporate Financial data files. Also, since weekly and monthly data are available and software differences are considerable, the Banks system deserves special mention. Data subdivides into weekly, monthly, quarterly, and annual series. i.e.....

Weekly Data

This section includes all items on the Bank of Canada Statement of Assets and Liabilities, the Weekly Financial Statistics and the Interest and Exchange Rates Report as published by the Bank of Canada. In all, 169 data series are available back to November 10, 1971. Updates to this data file are made by 9:00 a.m. Friday. The data is directly accessed through a simple print programme which retrieves data for given item numbers and dates. The programmer may also access the data with his own programme via a subroutine.

Monthly Data

This section includes the 43 monthly Assets and Liabilities items which appear in the supplement to the Canada Gazette. The file extends back to June 1963. Updates are made by 9:00 a.m. on the Monday immediately after the Friday on which the data is released. The data is directly accessed by a report generator and a subroutine to be used in members' programmes. The report generator can be used for any or all banks over one or more time periods. It performs simple calculations and prints a report according to specifications supplied by the user.

Quarterly Data

The file contains 19 revenue and expense items per quarter for the eight major banks since 1967. Data for the Bank of British Columbia is available semi-annually. Data is available on a quarterly and year-to-date basis. Updates to this file are made within an hour of the publication of the information. The file is directly accessed by a report generator and a subroutine to be used in members' programmes. The programmes of general use are similar to those working on the monthly file.

Annual Data

The banks' annual reports are the source of the annual data. It includes the Statement of Revenue, Expenses and Undivided Profits, the Statement of Accumulated Appropriations for Losses and the Statement of Assets and Liabilities. There are 78 items available back to 1960. Information is available within two hours of release. The file is directly accessed by a report generator and a subroutine to be used in members' programmes. These programmes are again similar to those associated with the monthly and quarterly data.

A Quarterly Bank performance summary, such as shown below, may be extracted from the Quarterly Bank Data. This report, which is published by the Financial Times and the Globe and Mail is typical of the type of information FRI members seek.

OPERATING PERFORMANCE OF THE MAJOR BANKS - 2ND QTR 1973
PREPARED FOR REPORT ON BUSINESS BY THE FINANCIAL RESEARCH INSTITUTE

2ND QTR APR. 30	REVENUES			EXPENDITURES			OPERATING PROFIT (BALANCE OF REVENUE)		
	$ 000	% CHANGE 73/72	% CHANGE 72/71	$ 000	% CHANGE 73/72	% CHANGE 72/71	$ 000	% CHANGE 73/72	% CHANGE 72/71
ROYAL	278,048	22.4	11.5	234,814	24.7	9.7	43,234	11.3	20.7
CIBC	237,075	17.2	15.9	195,618	17.9	11.5	41,457	14.2	41.1
B OF M	219,918	24.7	7.5	189,293	28.3	4.0	30,625	5.9	30.3
NOVA SC	175,416	33.9	7.0	150,389	43.6	1.2	25,027	-4.7	38.9
TOR-DOM	146,249	32.0	7.1	125,328	35.5	3.5	20,921	14.3	30.2
BCN	54,335	28.5	13.9	46,704	25.7	12.3	7,632	49.1	27.4
PROVINC	36,387	30.9	25.0	31,831	35.8	31.9	4,556	4.5	-2.6
MERCAN	9,131	60.6	35.8	7,447	68.1	27.0	1,684	34.0	79.9
TOTALS	1,156,560	25.2	11.0	981,424	28.5	7.7	175,136	9.9	30.4

QUARTERLY OPERATING PROFIT

19	2ND QTR 73 $ MILLION	% CHANGE /	1ST QTR 73 $ MILLION	% CHANGE /	4TH QTR 72 $ MILLION	% CHANGE /	3RD QTR 72 $ MILLION	% CHANGE /
ROYAL	43.234	-10.4	48.270	24.3	38.843	-6.0	41.302	6.3
CIBC	41.457	2.6	40.392	-8.3	44.068	19.7	36.826	1.4
B OF M	30.625	0.2	30.555	-1.4	30.973	14.2	27.122	-6.2
NOVA SC	25.027	-8.7	27.410	9.6	25.003	-5.0	26.331	0.3
TOR-DOM	20.921	-3.9	21.778	4.1	20.925	15.0	18.204	-0.5
BCN	7.632	7.4	7.106	15.1	6.175	15.9	5.330	4.1
PROVINC	4.556	2.0	4.469	26.1	3.544	-14.1	4.125	-5.3
MERCAN	1.684	29.4	1.302	-0.4	1.308	18.4	1.105	-12.1
BR COL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	175.136	-3.4	181.282	6.1	170.840	6.5	160.343	0.6

QUARTERLY REVENUE

19	2ND QTR 73 $ MILLION	% CHANGE /	1ST QTR 73 $ MILLION	% CHANGE /	4TH QTR 72 $ MILLION	% CHANGE /	3RD QTR 72 $ MILLION	% CHANGE /
ROYAL	278.048	6.2	261.750	7.7	243.129	2.3	237.681	4.6
CIBC	237.075	5.0	225.804	1.2	223.182	5.7	211.208	4.4
B OF M	219.918	9.3	201.224	3.9	193.645	3.9	186.426	5.7
NOVA SC	175.416	8.2	162.189	8.5	149.521	6.7	140.145	7.0
TOR-DOM	146.249	9.7	133.316	5.6	126.261	6.7	118.356	6.6
BCN	54.335	9.1	49.789	7.1	46.478	4.7	44.394	5.0
PROVINC	36.387	10.5	32.924	7.1	30.755	10.5	27.842	0.1
MERCAN	9.131	14.1	8.002	13.4	7.054	7.4	6.567	15.5
BR COL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTALS	1156.560	7.6	1074.998	5.4	1020.026	4.9	972.620	5.3

Another report offers an analysis of loan income. The market share statistics are of particular interest.

CANADIAN BANKING STATISTICS FOR 3 MOS APR 1973 PAGE 1
LOANS REPORT

	B OF M	SCOTIA	TOR-DOM	PROVIN	COM IMP
LOANS IN CAN CURRENCY (INC DAY CALL & SHORT)	6,185,122	3,790,848	3,888,754	997,286	7,478,869
INCOME FROM LOANS....	172,138	145,730	116,890	28,468	178,482
SHARE OF MARKET LOANS IN CAN CURRENCY (INC DAY CALL & SHORT)	19.456	11.924	12.232	3.137	23.720
SHARE OF MARKET LOAN INCOME.....	18.948	16.041	12.867	3.134	19.823
LOAN INCOME AS % OF LOANS.....	2.783	3.844	3.006	2.855	2.386
LOAN INCOME AS % OF TOTAL REVENUE.....	78.274	83.076	79.925	78.236	75.285

CANADIAN BANKING STATISTICS FOR 3 MOS APR 1973 PAGE 1
LOANS REPORT

	ROYAL	CAN NAT	MERCAN	BRIT-COL	ALL BANK
LOANS IN CAN CURRENCY (INC DAY CALL & SHORT)	7,144,935	1,734,088	406,569	164,410	31,798,281
INCOME FROM LOANS....	222,135	36,532	8,101	0	900,374
SHARE OF MARKET LOANS IN CAN CURRENCY (INC DAY CALL & SHORT)	22.470	5.453	1.279	0.517	100.000
SHARE OF MARKET LOAN INCOME.....	24.671	4.057	0.900	0.0	100.000
LOAN INCOME AS % OF LOANS.....	3.109	2.107	1.993	0.0	2.832
LOAN INCOME AS % OF TOTAL REVENUE.....	79.891	67.234	88.720	0.0	78.469

3.6. PORTFOLIO MANAGEMENT INFORMATION SYSTEM

The FRI Portfolio Management Information System represents a major software development, and so is considered as a separate entity. It relies on data from the Bond Quotations (3.1) and Daily Stock Exchange Information System (3.2) data banks, as well as members' private data (i.e. non-listed stocks, etc.). It has been designed by FRI for the portfolio manager and is used for maintaining records and calculating portfolio valuations. The system includes a transaction record bookkeeping sub-system and a performance measurement package as options. Reports may be obtained in standard format or easily tailored to meet specific requirements. Conversational programmes are used to:

- set up a classification scheme for all the securities held in the portfolios to be maintained on the system. Each class is assigned a title and title number. Many classes are allowed and each security may have several classes associated with it.
- set up the initial portfolio and handle all ensuing transactions to and from it. Maintenance is minimal.
- evaluate the Portfolio for any date.
- deal with securities not on the FRI data banks but which constitute a part of the portfolio.
- measure performance over a period of time. The techniques of measuring portfolio performance and risk within a portfolio which are incorporated in this programme were taken from the Bank Administration Institute (an American institute) study of performance of pension funds and from several other sources.
- generate a report of Alpha, Beta, and R-Squared for the securities in the portfolio.
- merge any number of individual portfolios for purposes of overall evaluation and performance measurement.
- screen many portfolios for particular securities to create special status reports.
- determine the total inventory of all securities in all portfolios. Total valuations are given by security and for each portfolio held.
- determine allocations made to individual brokers.
- calculate income generated from dividends.
- create capital gains reports.

The following is characteristic of the portfolio statistics report which may be generated by 9:00 a.m. daily for the previous day, or any market day back to June 1969.

FINANCIAL RESEARCH INSTITUTE
HYPOTHETICAL PORTFOLIO

HOLDINGS	SECURITY NAME	DIVIDEND COUPON	UNIT COST	TOTAL COST	% AT COST	MARKET PRICE	TOTAL VALUE	% AT MARKET	YIELD COST	YIELD MARKET	% CHANGE BOOK MARKET
BONDS											
	FEDERAL GOVERNMENT										
100,000	CANADA 7.250 01/04/74	7.250	100.250	100,250.00	2.43	100.250	100,250.00	2.44	6.94	6.94	0.0
100,000	CANADA 5.500 01/10/75	5.500	98.300	98,300.00	2.38	96.300	96,300.00	2.34	6.29	7.25	-2.03
100,000	CNR 5.000 01/10/87	5.000	74.500	74,500.00	1.81	74.500	74,500.00	1.81	8.03	8.03	0.0
				273,050.00	6.62		271,050.00	6.60	7.00	7.35	-0.73
	PROVINCIAL GOVERNMENT										
100,000	ALBERTA 6.875 15/06/76	6.875	97.000	97,000.00	2.35	97.000	97,000.00	2.36	8.00	8.00	0.0
100,000	BC ELECTRIC 6.500 01/04/90	6.500	86.000	86,000.00	2.09	83.000	83,000.00	2.02	8.03	8.40	-3.49
100,000	MAN TEL 7.875 15/11/91	7.875	96.000	96,000.00	2.33	96.000	96,000.00	2.34	8.30	8.30	0.0
100,000	MANITOBA 4.750 15/12/76	4.750	92.750	92,750.00	2.25	90.500	90,500.00	2.20	7.10	7.87	-2.43
100,000	QUEBEC 9.500 01/10/95	9.500	107.000	107,000.00	2.60	106.000	106,000.00	2.58	8.78	8.88	-0.93
				478,750.00	11.61		472,500.00	11.50	8.07	8.30	-1.31
	MUNICIPAL GOVERNMENT										
100,000	METR TORONTO 5.000 15/02/82	5.000	83.500	83,500.00	2.03	83.000	83,000.00	2.02	7.63	7.72	-0.60
100,000	METR TORONTO 7.750 01/12/91	7.750	95.250	95,250.00	2.31	91.500	91,500.00	2.23	8.26	8.68	-3.94
100,000	MONTREAL 9.250 15/03/90	9.250	105.500	105,500.00	2.56	103.000	103,000.00	2.51	8.62	8.90	-2.37
100,000	OTTAWA 8.000 15/11/91	8.000	93.500	93,500.00	2.27	93.500	93,500.00	2.28	8.71	8.71	0.0

HOLDINGS	SECURITY NAME	DIVIDEND COUPON	UNIT COST	TOTAL COST	% AT COST	MARKET PRICE	TOTAL VALUE	% AT MARKET	YIELD COST	YIELD MARKET	% CHANGE BOOK MARKET
100,000	VANC CITY 8.000 01/04/91	8.000	95.500	95,500.00	2.32	93.500	93,500.00	2.28	8.49	8.73	-2.09
100,000	WINNIPEG 7.750 01/12/91	7.750	94.000	94,000.00	2.28	91.000	91,000.00	2.22	8.39	8.74	-3.19
				567,250.00	13.76		555,500.00	13.52	8.37	8.60	-2.07
	CORPORATES										
100,000	C.P.R. 8.875 01/02/92	8.875	104.000	104,000.00	2.52	102.000	102,000.00	2.48	8.45	8.66	-1.92
100,000	CONSUMER GAS 8.625 15/10/93	8.625	101.000	101,000.00	2.45	100.500	100,500.00	2.45	8.52	8.57	-0.50
100,000	EATON ACC 8.250 01/12/91	8.250	97.000	97,000.00	2.35	97.000	97,000.00	2.36	8.58	8.58	0.0
100,000	I.A.C. 7.500 15/12/86	7.500	92.000	92,000.00	2.23	90.000	90,000.00	2.19	8.51	8.78	-2.17
100,000	ROYNAT 9.000 15/11/79	9.000	106.000	106,000.00	2.57	104.000	104,000.00	2.53	7.80	8.19	-1.89
100,000	TD BANK 7.750 01/02/97	7.750	93.500	93,500.00	2.27	94.000	94,000.00	2.29	8.39	8.33	0.53
				593,500.00	14.39		587,500.00	14.30	8.37	8.51	-1.01
	UTILITIES										
100,000	BELL CANADA 9.000 15/01/89	9.000	104.000	104,000.00	2.52	104.000	104,000.00	2.53	8.53	8.53	0.0
100,000	CONSUMER GAS 8.000 15/02/92	8.000	95.000	95,000.00	2.30	95.000	95,000.00	2.31	8.54	8.54	0.0
100,000	I.P.L. 9.375 01/12/90	9.375	108.000	108,000.00	2.62	105.000	105,000.00	2.56	8.49	8.81	-2.78
				307,000.00	7.45		304,000.00	7.40	8.52	8.63	-0.98
TOTAL BONDS				2,219,550.00	53.83		2,190,550.00	53.33	8.16	8.36	-1.31
COMMON STOCKS											
	DISTILLERS										
2,000	WALKER-GOODE	1.650	52.000	104,000.00	2.52	52.500	105,000.00	2.56	3.17	3.14	0.96
				104,000.00	2.52		105,000.00	2.56	3.17	3.14	0.96
	MISCELLANEOUS										
10,000	ACKLANDS LTD	0.080	11.000	110,000.00	2.67	11.000	110,000.00	2.68	0.73	0.73	0.0

HOLDINGS	SECURITY NAME	DIVIDEND COUPON	UNIT COST	TOTAL COST	% AT COST	MARKET PRICE	TOTAL VALUE	% AT MARKET	YIELD COST	YIELD MARKET	% CHANGE BOOK MARKET
2,000	AM TEL + TEL	2.800	51.096US	103,000.00	2.50	51.125US	102,025.05	2.49	5.42	5.48	-1.10
10,000	CRUSH INTL	0.320	12.000	120,000.00	2.91	11.750	117,500.00	2.86	2.67	2.72	-2.08
1,000	GEN MOTORS	4.450	72.149US	71,875.00	1.74	66.625US	66,478.42	1.62	6.17	6.68	-7.66
200	INTL BUS MAC	4.480	434.150US	86,500.00	2.10	319.750US	63,809.31	1.55	1.03	1.40	-26.35
5,000	SHERRITT	0.400	17.000	85,000.00	2.06	15.875	79,375.00	1.93	2.35	2.52	-6.62
10,000	STEEP ROCK	0.150	1.620	16,200.00	0.39	1.750	17,500.00	0.43	9.26	8.57	8.02
				592,575.00	14.37		550,687.78	13.55	3.11	3.31	-6.06
	MINING-GOLD-SILVER										
500	DOME MINES	1.000	78.500	39,250.00	0.95	97.000	48,500.00	1.18	1.27	1.03	23.57
10,000	GIANT YELLOW	0.400	7.750	77,500.00	1.88	8.900	89,000.00	2.17	5.16	4.49	14.84
2,000	HOLLINGER	1.600	45.000	90,000.00	2.18	47.000	94,000.00	2.29	3.56	3.40	4.44
				206,750.00	5.01		231,500.00	5.64	3.73	3.32	11.97
	OIL & GAS INDUSTRY										
3,000	IMPERIAL OIL	0.600	37.125	111,375.00	2.70	40.875	122,625.00	2.99	1.62	1.47	10.10
2,000	TEXACO CDA	1.200	57.500	115,000.00	2.79	60.000	120,000.00	2.92	2.09	2.00	4.35
				226,375.00	5.49		242,625.00	5.91	1.86	1.73	7.18
	REAL ESTATE										
5,000	TRIZEC CORP	0.400	18.375	91,875.00	2.23	20.000	100,000.00	2.43	2.18	2.00	8.84
				91,875.00	2.23		100,000.00	2.43	2.18	2.00	8.84
	STEEL INDUSTRY										
5,000	ALGOMA STEEL	0.500	16.500	82,500.00	2.00	18.000	90,000.00	2.19	3.03	2.78	9.09
4,000	DOM FDR&STL	1.000	27.000	108,000.00	2.62	27.125	108,500.00	2.64	3.70	3.69	0.46
3,000	STEEL CO CDA	1.250	30.125	90,375.00	2.19	31.500	94,500.00	2.30	4.15	3.97	4.56
				280,875.00	6.81		293,000.00	7.13	3.65	3.50	4.32
	WINES-BEERS										
5,000	BRIGHT T G	0.400	18.750	93,750.00	2.27	19.750	98,750.00	2.40	2.13	2.03	5.33
3,000	CDA MALTING	1.400	30.000	90,000.00	2.18	28.250	84,750.00	2.06	4.67	4.96	-5.83
20,000	CDN BREWERIE	0.0	4.850	97,000.00	2.35	4.200	84,000.00	2.05	0.0	0.0	-13.40
2,000	CHATEAU-GAI	0.500	45.000	90,000.00	2.18	45.000	90,000.00	2.19	1.11	1.11	0.0
				370,750.00	8.99		357,500.00	8.70	1.94	2.02	-3.57
TOTAL COMMON STOCKS				1,873,200.00	45.43		1,886,312.78	45.93	2.83	2.81	0.70
	CASH			20,725.50			20,725.50				
	PROFIT/LOSS ACCOUNT			9,750.00			9,750.00				
	TOTAL CASH			30,475.50	0.74		30,475.50	0.74			
TOTAL				4,123,225.50	100.00		4,107,338.28	100.00	5.68	5.75	-0.39

EXCHANGE RATE $1.00US = $0.99780CD

3.7. FRI UTILITY PROGRAMMES

FRI's programme library contains a number of programmes of general use which are not dependent on any particular data bank. These programmes are in an easy-to-understand conversational form, very efficient and easy to run. They may be used to perform the following calculations or analyses:

- internal rate of return (IRR) of a series of payments and receipts.
- linear and compound linear trends for a series of observations. Goodness of fit tests are carried out.
- multiple regression analysis.
- step-wise regression analysis.
- growth triangle to determine the compound growth rate between any two points in a data series.
- compound growth rate of a data series using the least squares method.
- amortization tables for a loan or mortgage. Several versions are available.
- net present value of a series of payments and receipts.
- plots of up to 9 individual series on a single graph.
- bond switch analysis.
- compute bond prices or yields (these have been mentioned briefly in Section 3.1.).

3.8. McGILL COMPUTING CENTRE PROGRAMMES

The McGill Computing Centre has a great number of programmes and subroutines which are available to all who use the McGill computer. These cover a wide range of subjects and are of particular interest to the more experienced programmer. The McGill programme library also includes the IBM scientific subroutine package and STATPAK for doing statistical analysis. FRI or Computing Centre staff may be approached for details concerning programme particulars or for a catalogue of what is available.

3.9. USER'S DATA AND PROGRAMMES

FRI, being a customer of the services provided by the McGill University Computing Centre, not only utilizes the hardware provided but also the various software systems. One of these systems is called MUSIC and it is this system through which access is gained to the various data banks. Programmes which access the FRI data banks are created and operate under MUSIC in a conversational time sharing environment. The MUSIC system is described in more detail in Section 3.10.

An FRI member does not necessarily have to be limited to using the FRI suite of programmes and data. FRI permits a user to access the data banks directly, so that he may combine his own private data with that on file or to meet special reporting requirements. To meet these needs, FRI provides access via linkage subroutines which may be called from a member's own programmes. A member so doing must abide by the rules specified in the MUSIC USER'S GUIDE, which may be obtained from FRI or directly from the Computing Centre. At times, when data entry is to be input by the user, FRI has specified the format so that incompatibilities will not exist.

3.10 MUSIC

INTRODUCTION

The McGill University System for Interactive Computing (MUSIC) is a logical development and extension of the IBM Remote Access Computing System (RAX). This development has been carried out by the Computing Centre at McGill University.

The McGill University Computing Centre operates two IBM computers: a system 370 Model 158 and a system 360 Model 75.

Both of these computers have communications equipment that permits access from remote terminals by telephone or direct line connection. The following systems are currently operational:

370 Model 155 MUSIC Time Sharing System
Conversational file entry and update.
Conversational time-sliced execution.

360 Model 75 Conversational Remote Job Entry (CRJE)
Conversational file entry and update.
Batch Execution.

Administrative Terminal System (ATS)
Conversational text editor for use in preparation of manuals, proposals, theses, specifications, form letters, etc.

Remote Job Entry (HASP-RJE)
Submission of batch jobs from remote IBM 360 computers, IBM 1130 computers, IBM 2780 high-speed terminals, the Univac 9300 computer etc.

Programming Language (APL)
Conversational time-shared terminal language.

Time Sharing Option (TSO)
Conversational file entry and update, conversational time shared execution, or batch job entry.

GENERAL DESCRIPTION

MUSIC permits many users to simultaneously share the resources of an IBM/360 or /370 computer. The system handles all communications with the remote terminals as a "foreground" task. When terminal users request certain functions (including the running of jobs) these functions are carried out in a 100,000 byte area of computer main storage, as time-sliced "background" tasks.

The computer time for all background tasks is recorded in the system Accounting File. The system Accounting File does not record computer time used for a foreground task, such tasks being part of the general overhead of the system.

The user controls the system by entering commands upon which the system acts. There are two classes of commands: "immediate" (those which cause an action to be performed immediately), and "deferred" (those which do not cause any action to be performed immediately, but rather serve as control lines which take effect when an immediate command is issued at a later time).

An important feature of the system is the ability to handle "conversational" reads. With this facility programmes can be written in such a manner that they can "interact" with the user at execution time.

For details on the MUSIC system, terminal operation, and other related topics, McGill provides a manual entitled "MUSIC USER'S GUIDE" which can be obtained by contacting FRI or the McGill Computing Centre directly.

It should be noted that although the FRI suite of conversational programmes can evade much of the MUSIC system details for the average user, familiarity with MUSIC is an asset.

PREFACE

The FP-FRI CANADIAN ANNUAL DATA FILE is a totally new computer - oriented source of financial information on Canadian public companies. It has been developed jointly by the Financial Post and the Financial Research Institute, based on the experience gained separately by both these organizations over the past five or six years.

FRI and its members, aided through the consultation and assistance of a number of leading Canadian financial analysts and the Canadian Institute of Chartered Accountants, have developed the specifications for the Data File. Accounting parameters and their detailed definitions have been generally agreed upon by all contributing parties. FRI assumes responsibility for assuring that the available information is recorded accurately and also determines which companies will be included in the file. The Financial Post, on the other hand, has the difficult and exacting task of processing annual reports to extract the correct data according to the definitions set down.

In determining the specifications for the file, the specific requirements of a number of groups were taken into account. Most representatives were drawn from FRI members themselves and these included institutional investors, investment researchers, underwriting departments, bank credit departments, corporate financial planning groups and a number of Government agencies. As a result, the file, along with related software, has been designed to be used as a background for a broad range of studies: eg: security analysis, ranking and screening, industry analysis, credit analysis, rate case investigations, etc.

At present, 300 Canadian companies, representing 30 significant industries are on file. 99 accounting parameters are covered for each company, and, where available, up to 14 years of data are stored. By year end, 1973, data for approximately 400 companies will comprise the file. In order to accommodate for future expansion, 120 accounting items have been provided for.

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EXHIBIT V - PMIS

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EXHIBIT VI - ECORAX

PREFACE

This manual is a primer to ECORAX, a computer program designed to retrieve and analyse the information on FRI's Economic Databank. The databank consists of all of the time series reported in the Canadian Statistical Review, as well as selected U.S. Economic Series, detailed Canadian Annual National Accounts, Bank of Canada statistics, and financial statistics on industrial corporations. This Economic data is maintained on the IBM 370, Model 155 computer at McGill University and is available through remote terminals, since the computer can be programmed from them with the help of a simple language called RAX.

The RAX language is used to enable the computer to run the ECORAX program. ECORAX then allows for repeated requests for economic information which are entered as data which ECORAX interprets. The input requests must be broken into four sections by commas and end with a period. The first section is the COMMAND section which is a list of manipulations to be performed by ECORAX. The second section is the DATABANK NAME section which is the name of the economic databank. The third section is the SERIES NUMBER section, which is a list of the reference numbers of the economic time series in the databank. The fourth and last section is the YEARS section which is a list of years for which the time series listed in section 3 are to be retrieved. In short, all data to be retrieved is specified by reference numbers of time series in section 3 of the request and the time period covered in section 4 of the request. The manipulations to be formed on the data specified in the last two sections of the request are listed in the first section of the request. The request, then, looks like this:

COMMANDS, DATABANK NAME, SERIES NUMBERS, YEARS.

NOTE: In the examples contained throughout this manual, the user's input, i.e. the information which the user must type on the terminal, is enclosed in a 'box' for quick reference.

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